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ScienceDirect

Nuclear Physics B 929 (2018) 79–112

NUCLEAR PHYSICS B

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The reconstruction of $f(\phi)R$ and mimetic gravity from viable slow-roll inflation

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Received 28 November 2017; received in revised form 24 January 2018; accepted 28 January 2018
Available online 5 February 2018
Editor: Hong-Jian He

Abstract

In this work, we extend the bottom-up reconstruction framework of $F(R)$ gravity to other modified gravities, and in particular for $f(\phi)R$ and mimetic $F(R)$ gravities. We investigate which are the important conditions in order for the method to work, and we study several viable cosmological evolutions, focusing on the inflationary era. Particularly, for the $f(\phi)R$ theory case, we specify the functional form of the Hubble rate and of the scalar-to-tensor ratio as a function of the e-foldings number and accordingly, the rest of the physical quantities and also the slow-roll and the corresponding observational indices can be calculated. The same method is applied in the mimetic $F(R)$ gravity case, and in both cases we thoroughly analyze the resulting free parameter space, in order to show that the viability of the models presented is guaranteed and secondly that there is a wide range of values of the free parameters for which the viability of the models occurs. In addition, the reconstruction method is also studied in the context of mimetic $F(R) = R$ gravity. As we demonstrate, the resulting theory is viable, and also in this case, only the scalar-to-tensor ratio needs to be specified, since the rest follow from this condition. Finally, we discuss in brief how the reconstruction method could function for other modified gravities.

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https://doi.org/10.1016/j.nuclphysb.2018.01.027